22. (New) An information display comprising:

a transmissive layer;

a plurality of independently operable light emitting devices disposed to emit light through the transmissive layer, thereby being capable of displaying information to a viewer; and

a frustrator element comprising a microstructured surface to frustrate total internal reflections of light emitted the plurality of independently operable light emitting devices, wherein the transmissive layer is disposed between the frustrator element and the plurality of independently operable light emitting devices.

23. (New) The information display of claim 22, wherein the microstructured surface comprises a plurality of prismatic structures.

24. (New) The information display of claim 22, wherein the microstructured surface is oriented away from the transmissive layer.

A version marked up to show changes made to the claim(s) relative to the previous version of the claim(s) is attached.

Remarks

The Amendment and Remarks are in response to the Office Action dated February 13, 2002. Claims 1-3 have been cancelled, claims 4-8 and 11-17 have been amended and claims 18-24 have been added. Claims 4-24 are pending. Examination and reconsideration of the application as amended is requested.

The Applicants thank the Examiner for indicating that claims 4 and 8-10 would be allowable if rewritten in independent form. Claims 4 and 8 have been rewritten in independent form, but do not incorporate all of the elements of independent claim 1.

Drawing and Specification

The Drawing was objected to because "the view 222" was not referenced on the drawing. The Applicants have removed the reference numeral 222 from the specification. The Applicants request withdrawal of this objection.

The Specification was objected to because the Abstract included the phrase "are disclosed that include". The Applicants have amended the Abstract to read "can include". The Applicants request withdrawal of this objection.

§ 103 Rejections

Claims 1-3 and 13-15 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over WO 98/17083 to Horikx et al. (hereinafter "Horikx") in view of U.S. Patent No. 5,910,706 to Stevens et al. (hereinafter "Stevens"). Claims 5-7, 11, 12, and 17 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Horikx in view of Stevens and further in view of U.S. Patent No. 6,091,085 to Lester (hereinafter "Lester"). Claim 16 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Horikx in view of Stevens and further in view of EP 0814621 to Stevens et al. (hereinafter "European application").

With respect to the rejection of claims 1-3 and 13-15. Claims 1-3 have been cancelled without prejudice and claims 13-15, as well as claims 5, 6, 16 and 17, now depend from claim 4 and are patentable for at least the same reasons as claim 4. Accordingly, the Applicants request that the rejections of claims 5, 6, and 13-17 be withdrawn.

With respect to claim 11, none of the cited references teach or suggest the use of a frustrator element having a surface diffuser where the frustrator element is positioned so that a transmissive layer is between the frustrator element and the light emitting devices. The Office Action indicates that Lester teaches the use of a diffusive surface. Lester describes roughening an upper surface or a side surface of an LED, but indicates that this is undesirable because it can leave islands in the top electrode that are not electrically contacted with the remainder of the electrode. In addition, the roughening can damage the semiconductor material below the electrode. Lester suggests other methods including roughening the surface of the sapphire substrate upon which the LED is formed, controlled disruption of the GaN upper surface, inserting vertical light pipes into the waveguide, or allowing GaN to form a roughened surface. None of these methods teaches or suggests the frustrator element recited in the Applicants' claims, where the frustrator element is positioned with a transmissive layer between the frustrator element and the light emitting devices. Instead Lester teaches modifying one or more layers of the light emitting device itself. Moreover, none of the cited references in combination teach or suggest the Applicants' invention. Accordingly, the Applicants submit that claim 11 is patentable over the cited references and respectfully request that this rejection be removed.

With respect to claims 7 and 12, independent claim 12 recites a frustrator element that has a microstructured surface. A microstructured film is a film that has at least one surface comprising a plurality of non-random structures that are smaller than the size of the light emitter device, as illustrated, for example, in Figures 5a and 5b. The Office Action asserts that Lester, col. 1, lines 37-44 teaches prismatic microstructures. Lester states:

> "One method that has been suggested form improving the extraction efficiency of an LED requires the LED to be macroscopically shaped such that light generated in the device strikes the surface at the critical angle or greater, thereby preventing the internal reflection problem described above. In these LEDs, the chip is shaped as a hemisphere or truncated pyrimid." (emphasis added)

Thus, Lester teaches macroscopically forming the entire LED (i.e., light emitting device) as a truncated pyrimid or other shape. Lester does not teach or suggest using a frustrator element, separate from the light emitting device, that has a microstructured surface. At most, Lester teaches elsewhere forming structures from the material of the light emitting device itself. This technique, however, is not suitable for all materials (Lester states that it utilizes "a particular property of GaN", col. 4, lines 42-44) and it may not be desirable to alter or complicate the structure of the light emitting device. The Applicants recited inventions provide for a frustrator element that can be added to an existing light emitting device, if desired. Accordingly, the Applicants submit that claims 7 and 12 are patentable over the cited references and request withdrawal of the rejection.

In view of the above, it is submitted that the application is in condition for allowance. Reconsideration of the application is requested. Allowance of claims 4-24, as amended, at an early date is solicited.

Respectfully submitted,

By _____
Bruce E. Black

Registration Number	Telephone Number
41,622	651-736-3366
Date May 7, 2002	

Office of Intellectual Property Counsel
3M Innovative Properties Company
P.O. Box 33427
St. Paul, Minnesota 55133-3427
Facsimile: (651) 736-3833

Version With Markings to Show Changes Made

Paragraph on page 7, lines 8-21:

Fig. 2 can be used to exemplify concepts of light trapping in an emissive display device. Without loss of generality, Fig. 2 shows an emissive display 210 that includes, for example, an OLED device 212 disposed on a glass substrate 220. OLED device 212 includes an organic emitter layer 214, a transparent anode 216, and a cathode 218. The space between the display 210 and the viewer [222] is air in this example. Organic emitter 214 can be approximated as an isotropic light source, with light being emitted over a wide range of angles. Cathode 218 is typically reflective so that light emitted toward the back of the display 210 can be redirected forward. Glass substrate 220 has a higher index of refraction than air (refractive index of air is about 1, and a typical refractive index of glass is about 1.5), and transparent anode 216 typically has a higher index of refraction than glass substrate 220. Exemplary transparent anodes include transparent conductive oxides such as indium tin oxide (ITO), which typically have an index of refraction of about 1.8.

Abstract from page 36.

Emissive displays [are disclosed that] <u>can</u> include a plurality of independently operable light emitters that emit light through one or more transmissive layers. The emissive displays further include elements disposed between the light emitters and the transmissive layers to frustrate total internal reflections that can occur at one or more of the interfaces created by the transmissive layers, such as at an interface between the light emitter and a transmissive layer or at an interface between a transmissive layer and air. By frustrating total internal reflections, the brightness of the emissive display can be enhanced. Elements for frustrating total internal reflections include volume diffusers, surface diffusers, microstructures, and combinations of these or other suitable elements.

4. (Amended) An information display comprising:

a plurality of independently operable light emitting devices disposed to emit light through a transmissive layer, thereby being capable of displaying information to a viewer; and

a volume diffuser disposed to receive light from the plurality of independently operable light emitting devices and to frustrate total internal reflections of light emitted the plurality of independently operable light emitting devices, [The information display of claim 1] wherein the volume diffuser comprises voids dispersed in a matrix material.

5. (Amended) The information display of claim [2] 4, wherein the volume diffuser further comprises a diffusive surface oriented toward the transmissive layer.

6. (Amended) The information display of claim [2] 4, wherein the volume diffuser further comprises a microstructured surface oriented toward the transmissive layer.

7. (Amended) The information display of claim [6] 12, wherein the microstructured surface comprises a plurality of prismatic structures.

8. (Amended) An information display comprising:

a plurality of independently operable light emitting devices disposed to emit light through a transmissive layer, thereby being capable of displaying information to a viewer; and

a volume diffuser disposed to receive light from the plurality of independently operable light emitting devices and to frustrate total internal reflections of light emitted the plurality of independently operable light emitting devices, [The information display of claim 2] wherein the volume diffuser further comprises a plurality of louvers disposed to inhibit cross-talk of light between separate light emitting devices.

11. (Amended) An information display comprising:

a transmissive layer;

a plurality of independently operable light emitting devices disposed to emit light through the transmissive layer, thereby being capable of displaying information to a viewer; and

a frustrator element [The information display of claim 1 wherein the frustrator element comprises] comprising a surface diffuser to frustrate total internal reflections of light emitted the plurality of independently operable light emitting devices, wherein the transmissive layer is disposed between the frustrator element and the plurality of independently operable light emitting devices.

12. (Amended) An information display comprising:

a transmissive layer;

a plurality of independently operable light emitting devices disposed to emit light through the transmissive layer, thereby being capable of displaying information to a viewer; and

a frustrator element disposed between at least one of the light emitting devices and the transmissive layer to frustrate total internal reflections of light emitted the plurality of independently operable light emitting devices, [The information display of claim 1] wherein the frustrator element comprises a microstructured surface oriented toward the transmissive layer.

13. (Amended) The information display of claim [1] 4, wherein the frustrator element comprises an antireflective element.

14. (Amended) The information display of claim [1] 4, wherein the plurality of light emitters comprise electroluminescent light emitting devices.

15. (Amended) The information display of claim [1] 4, wherein the plurality of light emitters comprise organic electroluminescent light emitting devices.

16. (Amended) The information display of claim [1] 4, wherein the plurality of light emitters comprise phosphor-based light emitting devices.

17. (Amended) The information display of claim [1] 4, further comprising a prismatic film disposed on a side of the transmissive layer opposing the light emitting devices.

18. (New) The information display of claim 4, wherein the volume diffuser is disposed between at least one of the light emitting devices and the transmissive layer.

19. (New) The information display of claim 4, wherein the volume diffuser is disposed between the transmissive layer and a viewer position.

20. (New) The information display of claim 8, wherein the volume diffuser is disposed between at least one of the light emitting devices and the transmissive layer.

21. (New) The information display of claim 8, wherein the volume diffuser is disposed between the transmissive layer and a viewer position.

22. (New) An information display comprising:

a transmissive layer;

a plurality of independently operable light emitting devices disposed to emit light through the transmissive layer, thereby being capable of displaying information to a viewer; and

a frustrator element comprising a microstructured surface to frustrate total internal reflections of light emitted the plurality of independently operable light emitting devices, wherein the transmissive layer is disposed between the frustrator element and the plurality of independently operable light emitting devices.

23. (New) The information display of claim 22, wherein the microstructured surface comprises a plurality of prismatic structures.

24. (New) The information display of claim 22, wherein the microstructured surface is oriented away from the transmissive layer.